

SOIL GAS SURVEY

VICINITY OF  
FORMER MOORE BUSINESS FORMS SITE  
FULLERTON, CALIFORNIA

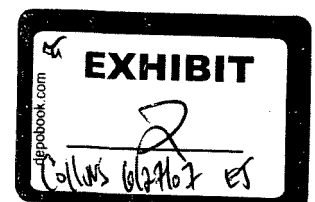
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Conducted in 1991  
by  
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## EXECUTIVE SUMMARY

In the initial stage of a site investigation at the former Moore Business Forms (MBF) facility in Fullerton, 500 parts per billion (ppb) of trichloroethene (TCE) was detected in a monitoring well that was installed at the site. A subsequent groundwater investigation detected similar TCE concentrations in this well and concentrations of over 50 ppb of TCE in other monitoring wells that were subsequently installed in other areas at the site. Continued sampling found TCE concentrations in the groundwater to range from 50 ppb to 200 ppb. Although volatile organic compounds (VOCs) were non-detectable in composite and discrete soil samples taken from soil borings during these two investigations, TCE and tetrachloroethene (PCE) were detected in the soil vapor at the site in two subsequent soil gas surveys.

In an effort to determine if the TCE found in the groundwater beneath the site was due to discharges from the former MBF facility or from adjacent off-site sources and to confirm the previous high soil gas levels at the former MBF site, a soil vapor survey using Petrex soil gas collection tubes was conducted by Board staff at the former MBF site (now California Shirt Sales) and at three sites which are adjacent to, and up-gradient of, the California Shirt Sales site.

A total of 17 soil gas collection tubes were installed at the four sites. Six tubes were installed at the Pacific Seacraft facility located south of the eastern half of the California Shirt Sales site. Three tubes were installed on the California Shirt Sales site. Four tubes were installed at the Johnson Controls Battery Division facility located east of the California Shirt Sales site, and four tubes were installed at the property of McLachlan Investments, which had been occupied by numerous tenants, and is currently occupied by Composite Container. The building at this site was recently Northrop Corporation's Y-19 Building, and is located southeast of the California Shirt Sales site.

The results of the soil gas survey showed that the highest TCE soil vapor flux was found in the southeast area of the former MBF site. The data also showed that the off-site locations closest to this area displayed a high TCE flux, although significantly lower than that found at the former MBF site. Similarly, the highest PCE soil vapor flux was found in the northeast area of the former MBF site and displayed a similar pattern as the TCE. The data supports the premise that TCE and PCE were previously discharged at the former MBF site. In addition, significantly high TCE and PCE vapor flux was found at a location on the McLachlan Investments Company property. It is recommended that Moore Business Forms conduct further soil investigations and groundwater monitoring, and that McLachlan Investments conduct a soil investigation in the area of high TCE and PCE soil gas.

## BACKGROUND

The former MBF site is located at 800 South Raymond Avenue in Fullerton, California (Figure 1). MBF purchased the property and began operations in 1957. Prior to 1957, the property, and most properties in the surrounding area, were orange groves. The area surrounding MBF became industrialized at approximately the same time as the MBF site. MBF occupied this site until 1983, when it sold the property to Raymond Associates (a general partnership). The facility remained idle between 1983 and 1988, when it was obtained by First Interstate Bank by foreclosure from Occidental Land Research (the principal owner). During these proceedings, Lincoln Property Company became interested in purchasing the property and hired Ebasco Environmental to conduct two phases of site investigations, as part of the property purchase procedure. After these two investigations were completed, Lincoln Properties decided not to purchase the property. Later in 1988, the property was sold to Ralph Horowitz and remained idle for almost a year. In 1989, Mr. Horowitz sold the property to Karl Sator, owner of California Shirt Sales. The facility has since been used as a warehouse outlet of tee-shirts, for California Shirt Sales.

In September and October 1988, a Phase I Site Assessment was performed at the former MBF site. This assessment was performed as part of an environmental investigation for a property transfer. The assessment consisted of drilling and sampling 21 soil borings, drilling, installing and sampling one groundwater monitoring well and assessing any impact from the presence of five underground storage tanks (USTs). Three of the five USTs (one containing gasoline, one containing diesel oil and one containing wax) had previously been removed, and verification samples were previously taken at these locations. One of the remaining two USTs contained photo lab waste and the other contained oil. These USTs were subsequently removed and verification samples taken. Soil borings were drilled to a maximum depth of 25 feet below ground surface (bgs), with the exception of two borings which were advanced to depths of 62 feet and 90 feet bgs. Soil samples from the soil borings were collected at a depth of one foot bgs and at five foot intervals thereafter. Five sets of composited samples from the various borings were taken at depths of one foot, five feet or a combination of both depths. No volatile organic compounds (VOCs) were detected in any of these composite samples with the exception of one which contained a small concentration of methylene chloride and toluene. Four discrete soil samples from two borings were analyzed for VOCs at depths of 2.5, 5, 40 and 45 feet bgs. None were detected. A monitoring well boring was drilled to a depth of 135 feet bgs. This well was screened in the interval between 85 feet bgs and 125 feet bgs. The groundwater sample taken from this monitoring well (MW-1) contained trichloroethene (TCE) at a

concentration of 500 parts per billion (ppb), in addition to 1.8 ppb of 1,2-dichloroethane (1,2-DCA) and 2.0 ppb of 1,1-dichloroethene (1,1-DCE). Groundwater depth was measured at 116.5 feet bgs. The report of this investigation, titled "Site Characterization Report - Former Moore Business Forms Property" was issued in October 1988. The presence of high TCE concentrations in the groundwater prompted the initiation of a Phase II Site Characterization.

The Phase II Site Characterization was performed in November 1988. This investigation consisted of drilling, sampling soil and installing and obtaining samples from three new monitoring wells. Each of the three wells were installed to a depth of 135 feet bgs. Unlike MW-1, however, these three wells were screened at the interval between 110 feet bgs and 135 feet bgs. MW-2 was installed in the northeast corner, MW-3 was installed near the northwest corner and MW-4 was installed in the southwest corner of the property near MW-1. One soil sample from each well boring, at a depth near the capillary fringe (115 feet bgs), was analyzed for VOCs. No VOCs were detected in the three samples. Analysis of the groundwater samples, however, yielded significant concentrations of TCE in all four wells. Groundwater depth was measured at 118 feet bgs. Samples from both MW-2 and MW-3 contained TCE concentrations of 55 ppb, while MW-4 contained TCE at 56 ppb. As a QA/QC check, MW-1 and MW-4 were resampled and the samples were analyzed at three different laboratories. The results for MW-1 yielded TCE concentrations of 150 ppb, 500 ppb and 350 ppb, while the results for MW-4 yielded TCE concentrations of 40 ppb, 60 ppb and 57 ppb. The data had shown that a fairly consistent groundwater TCE concentration ranging between 40 and 60 ppb was present beneath the former MBF site. However, the groundwater in the area around MW-1 contained a concentration ranging between 150 ppb and 500 ppb. The report concluded that since no TCE had been found in the soil and since TCE was never documented as being used at the facility, the TCE contamination in the groundwater was emanating from an up-gradient source, and not from the former MBF site. The results and conclusions of this investigation were issued in a report titled "Phase II Site Characterization - Former Moore Business Forms Property", in December 1988.

During the period when the Phase II site characterization was being performed (October 1988 to January 1989), the Orange County Water District (OCWD) conducted a static soil gas survey, using Tracer Research, to determine the approximate areal extent of VOCs within the Orange County Groundwater Basin and to assist in locating potential source areas. In January 1989, Tracer Research obtained soil gas samples at four locations along the perimeter of the former MBF site. With the exception of tetrachloroethylene (PCE) at three of the locations, the results yielded VOC soil vapor concentrations in the hundredths to the ten-thousandths of a ppb in all samples. PCE soil vapor concentrations of 4.0 and 0.7 ppb were found at two locations in the extreme northeast, while a third

location on the extreme west side, near MW-1, contained a PCE concentration of 0.9 ppb. Subsequently, as part of the activities of the property transfer, a Tracer Research soil gas survey was performed on the former MBF site by Ebasco Environmental for the Lincoln Property Company. Eight sampling locations on the site were chosen. The results yielded much higher TCE and PCE concentrations than the OCWD survey. The location with the highest concentrations of VOCs was in the northern area along the east side of the property. TCE was measured at 380 ppb and PCE was measured at 1800 ppb. The second highest VOC concentrations were found along the east side about mid-way south of the property. TCE was measured at 2 ppb, PCE was measured at 55 ppb and trichloroethane (TCA) was measured at 6 ppb. At a location in the extreme southeast corner, TCE was measured at 25 ppb and PCE was measured at 0.04 ppb. Finally, at a location in the southeast parking area, TCE was measured at 87 ppb while PCE was measured at 0.02 ppb. Three sampling locations surrounding MW-1 and on the west side of the property yielded concentrations in the thousandths and ten-thousandths of a ppb range. The bulk of the high soil gas TCE and PCE concentrations were found on the eastern side of the property. Most of the wells are located on the west side of the property.

Board staff issued a letter on February 27, 1989, requesting MBF to submit a work plan to conduct an additional subsurface investigation, including the installation of up-gradient monitoring wells and analysis of soil samples from the well borings. MBF was also requested to submit a completed Chemical Use Questionnaire. The Questionnaire was submitted within the requested time period but the work plan was not submitted until August 24, 1989.

The Phase III Subsurface Investigation was conducted for MBF by Roux Associates between December 1989 and February 1990. In December, all of the monitoring well elevations were re-surveyed and water level measurements were taken to produce a current potentiometric groundwater elevation contour map. Two new up-gradient monitoring wells were proposed to be installed in the southeast corner of the site. One well was proposed along the eastern boundary and the other well was proposed along the southern boundary. However, by the time Board staff had arrived at the site, the southern boundary monitoring well (MW-5) boring was drilled past the mid-point of the site, on the western side. It was explained that the decision to move this location was made in the field because of access problems in the eastern half of the site and that this well location was hydraulically up-gradient of MW-1. With the understanding that a second up-gradient well would be installed in the southeast area, which is hydraulically up-gradient of the area of high VOC soil gas concentrations, Board staff did not object to this well being installed. However, the second well was never installed. No soil samples from the well boring were analyzed in the laboratory for VOCs and only field headspace vapor analyses were performed. Also, this data never appeared in the report. After initial well development, a sample

of MW-5 taken on January 19, 1990, yielded a TCE concentration of 44 ppb. A Regional Board split sample yielded 48 ppb of TCE, along with 4.8 ppb of 1,1,1-TCA and 4.0 ppb of 1,1-DCE. Monitoring wells MW-2, MW-3 and MW-4 were then sampled on January 22, 1990, yielding TCE concentrations of 51 ppb, 120 ppb and 220 ppb, respectively. MW-1 was dry due to falling groundwater levels and thus could not be sampled. On February 12 and 13, 1990, Roux conducted a second round of sampling. MW-2, MW-3, MW-4 and MW-5 yielded 58 ppb, 180 ppb, 210 ppb and 200 ppb of TCE, respectively. The results indicated that the wells on the west side of the site had increased from around 50 ppb to around 200 ppb of TCE since November 1988. It appears that, Roux's conclusion that the TCE was originating from an off-site source was based on only one of two data points from MW-5 (the second round sample of 200 ppb).

Despite repeated Board staff requests for MBF to install the second up-gradient well and continue well monitoring, no further work has been performed. As a result, Board staff elected to conduct this soil gas survey to gather additional evidence of TCE contamination at and near the former MBF site.

## HYDROGEOLOGIC INFORMATION

The former MBF site is located in the forebay zone of the Orange County Groundwater Basin. Most of the recharge of groundwater entering this basin occurs within a several mile radius of the site. The Santa Ana River, and the OCWD recharge basins, are located within two miles of the site. Several flood channel retarding basins, which also act as recharge basins, are located within one mile of the site. The recharge zone consists of the uppermost sediments, which are of Holocene-age alluvium and colluvium, consisting of primarily poorly sorted sands, clayey sands, gravel and silt. The surface topography is relatively flat, with a gentle southwest slope from the Coyote Hills, approximately 1.5 miles to the north, to the Pacific Ocean.

The depth to groundwater beneath the former MBF site has ranged from 116 feet to over 125 feet bgs. Recent water level measurements performed at the site by OCWD found the depth to water to be between 131 and 133 feet bgs. The reason for the drop in water levels is primarily due to the drought, with the lack of normal recharge and the increased pumping of water wells. The City of Fullerton's Kimberly Well No. 1 is located directly adjacent to the northeast corner of the former MBF site. This well pumps water all year and is part of the City of Fullerton's water supply. The general groundwater flow direction is to the west-southwest. However, the groundwater flow direction apparently changes seasonally. The predominant west to southwest flow direction occurs most of the year, between June and January. A shift to the west-northwest mainly occurs between February and May when the rains recharge groundwater, driving the flow away from the Santa Ana River. Much of this was not known prior to the Phase III Investigation, and the placement of MW-5 was based on the less frequent winter-spring flow direction.

## PROJECT DESCRIPTION

Four sites were selected for soil gas sampling (see Figure 1). With a limited number of soil gas sampling tubes available, only a limited number of sampling locations per site were selected. The four sites that were selected, and their rationale for selection, are as follows:

### Site #1 - Pacific Seacraft Corporation

This facility uses organic resins and solvents (reportedly not TCE or PCE), and is hydraulically up-gradient of the former MBF site during the short winter-spring seasonal groundwater flow to the west-northwest.

### Site #2 - California Shirt Sales (former MBF site)

Previous soil vapor survey readings indicated VOC levels were much higher than the surrounding area. The sample locations were chosen to confirm the prior high soil gas levels.

### Site #3 - Johnson Controls - Battery Division

This site is located directly east, and hydraulically up-gradient, of the former MBF site through most of the year. However, organic solvents such as TCE and PCE are not documented as ever being used at this facility.

### Site #4 - McLachlan Investment Company Building (1401 East Orangethorpe Avenue)

This site is also located hydraulically up-gradient of the former MBF site during the winter-spring period of the year. It has also been the site of various past industrial facilities, most recently Northrop Corporation (1981 to 1990 as a warehouse) as well as several machining and fabrication operations, including the Memorex Corporation and the Sylvania Corporation. A portion of the building is currently occupied by Composite Containers and is used as an office and small warehouse.

Prior to installing the Petrex soil gas sampling tubes, site access permission had to be obtained from each site owner. For Site #1, permission was obtained from Mr. Alan Massey and Joe Lock from Pacific Seacraft Corporation. For Site #2, permission was obtained from Mr. Karl Sator, owner of California Shirt Sales. For Site #3, permission was obtained from Mr. James Cox, Vice President, and Mr. Chuck Burks, Environmental Specialist, from Johnson Controls - Battery Division. For Site #4, permission was obtained from Mr. Don Sutro, Vice President of McLachlan Investment Company. Copies of the site access permission request letters, including the proposed locations for installing Petrex tubes, are included in Appendix No. 1. Prior to the soil gas survey, we also contacted Roux Associates, environmental contractors for Moore Business Forms, to inform them of the dates we were going to perform the survey. They had previously requested that we notify them so they could have an observer present while Board staff performed the survey.

On November 14, 1991, 9 Petrex soil gas collection tubes were installed at Site #1 and Site #2 by Dennis Merklin and Kamron Saremi of Board staff. At both sites, drilling through asphaltic concrete was necessary to place the tubes. This was accomplished by using a Boche Rotary Hammer with a 2-inch drill bit. The soil was then augered down to 12 to 18 inches bgs using both the drill bit and a hand trowel. Six collection tubes, including one dual wire tube, were installed at Pacific Seacraft Corp. (Site #1). The samples were labeled #1 through #7. Four tubes (Samples #1, #2, #3, #4 and #6) were placed in each of the four corners of the facility, with the two tubes in the back corners placed between approximately 5 and 12 feet from the boundary with the southeast corner of the former MBF site. The tube in the northeast corner of the site was a dual QA/QC collector wire tube, and the samples were labeled #3 & #4. The fifth tube (Sample #5) was placed near the hazardous materials storage area. The sixth tube (Sample #7) was placed in the parking lot in the southwest corner of the property. Each tube at this site had a clean cotton string tied to the cap screw thread area, which was then run to just below the ground cover, for easy retrieval.

Three collection tubes were installed in the eastern area of the former MBF site (Site #2), where high soil gas readings were found in previous investigations. Two tubes were placed in the driveway between the building and the east property fence line. One of these tubes (Sample #8) was placed near the gate at the northeast corner of the property. The second tube at the next location contained dual QA/QC collector wires, labeled Samples #9 & #10, and was placed at about the mid-point of the property. The third tube (Sample #11) was placed in the middle of the parking lot area in the southeast section of the property. Having run out of the cotton string which was used at the previous Pacific Seacraft Corp. site, a strip of plastic mylar was tied and arranged for the 3 tubes at this site, in the same manner as for the previous site.

To be certain that the plastic mylar did not contribute any VOCs to the tube while placed in the ground, a site blank was created (Sample #101) by keeping a piece of the mylar material in the tube the entire time of the survey, and having it analyzed with the other tubes. The location of each tube was accurately mapped, recorded on diagrams and photographed. The field maps and records are presented in Appendix No. 2, while the photographs are presented in Appendix No. 3. All the tubes were installed in accordance with standard protocol (Appendix No. 4).

On November 15, 1991, 8 Petrex collection tubes were installed at Site #3 and Site #4 by Dennis Merklin and Robert Holub. Four collector tubes were installed at Johnson Controls - Battery Division (Site #3), along its western border with the former MBF site. These tubes were labeled Samples #12 through #15. At each sample location, the soil was hand augered to a depth of between 12 and 18 inches bgs. Samples #12 and #14 were placed on the west side of the railroad tracks and Samples #13 and #15 were placed on the east side of the tracks. Sample #12 was placed opposite Sample #8 on the former MBF site while Sample #13 was placed almost opposite Samples #9 & #10 on the former MBF site. Sample #14 was placed further south, opposite approximately halfway between the end of the driveway and the southeast parking area (between Samples #9 & #10 and #11) on the former MBF site. Sample #15 was placed in the southwest corner of the Johnson Controls site, below the base of an old loading ramp, on the east side of the railroad spur tracks, opposite the southern part of the former MBF site parking area.

Four collector tubes were also installed at the McLachlan Investments property (Site #4), along the railroad spur tracks and the Pacific Seacraft site boundary fence. These tubes were labeled Samples #16 through #19. Sample #16 was placed in the northwest corner of the site, on the west side of the railroad spur, between the tracks and the Pacific Seacraft site fence. Sample #17 was placed further south on the east side of the tracks, along the northwest corner of the building, under a loading platform door. Sample #18 was placed further south, about at the mid-point of the building on the west side of the railroad spur, between the tracks and the Pacific Seacraft site fence. Lastly, Sample #19 was placed on the west side of the southern end of the railroad spur, between the Pacific Seacraft site fence and the tracks.

The boundary between the Pacific Seacraft fence and the McLachlan Investments building continues further south, but there was very little room to proceed down further, and it was decided that this was probably beyond the influence of any up-gradient sources which could effect the former MBF site. No photographs were taken at these sites. However, the sample tube locations were mapped and recorded on diagrams in the same manner as the previous two sites. These maps also appear in Appendix No. 2. In addition to the previously mentioned Site Blank (Sample #101), a Trip Blank, Sample

#102, was brought to both sites on both days. This tube was not opened. On both days, Greg Murphy (Roux Associates) was present at the sites to observe the installation of the soil gas collection tubes.

On December 19, 1991, all of the tubes were removed from the ground and were sealed and labeled. Greg Murphy was present again to observe the removal of the tubes. The tubes had been in the ground for five weeks. Each set of tubes from each of the two days, along with the two Blanks, were packaged in separate bags, wrapped in protective packaging and boxed for shipment. The tubes were shipped to the Northeast Research Institute (NERI) for chemical analysis on December 26, 1991. Accompanying information included the Chain Of Custody Forms, the Wire Submittal Forms and the Bag Content Information Sheets. Copies of each set of these forms are included in Appendix No. 5.

## RESULTS

PCE was detected in every sample at all four sites. TCE was also detected at every site, but only in 11 of the 17 samples. In addition, aliphatic hydrocarbons were detected in every sample at each site. Aromatic hydrocarbons were detected in all samples at Pacific Seacraft Corp. and the former MBF site. At Johnson Controls - Battery Division and McLachlan Investments Company, aromatic hydrocarbons were detected in three of the four samples at each site. Aromatic hydrocarbons were also detected in Site Blank #101 at the former MBF site, although at a significantly lower ion count. Therefore, it is believed that the aromatic hydrocarbons were emanating from the plastic mylar used to tie the sample tubes in place. Sample #101 did not contain any TCE, PCE or aliphatic hydrocarbons. A Final Report of chemical analysis, including the ion counts and GC Graphs for each sample and blank, plus a short narrative evaluation of the results, was received from NERI on January 21, 1992. A copy of this Final Report is included in Appendix No. 6.

Figure 2 shows the four sites, all sample locations, and the ion counts of TCE found at each sample location, while Figure 3 shows the same for PCE. TCE was detected in 3 of the 6 samples at the Pacific Seacraft Corp. site, 2 of the 3 samples at the former MBF site, 3 of the 4 samples at the Johnson Controls site and 3 of the 4 samples at the McLachlan Investments site. The highest ion count of TCE was 233052, found in Sample #11 located at the center of the southeast parking lot area of the former MBF site. The highest ion count of PCE was 232656, also found at this site, in Sample #8 located in the northeast corner driveway entrance. However, no TCE was found in this sample. The TCE ion counts which were quantified ranged from 1262 to 233052. PCE ion counts ranged from 2032 to 232656.

The aliphatic hydrocarbons consist of 6, 10 and 11 carbon chain compounds and dienes. The ion counts ranged from 895 in Sample #18, located along the railroad spur on the McLachlan Investments site, to 119959 in Sample #12, located in the northwest corner of the Johnson Controls site. The aromatic hydrocarbons consist not only of benzene, toluene, xylenes and ethylbenzene, which are gasoline components, but other volatile organic chemicals (VOCs) containing up to 9 carbon chain compounds. It is these higher carbon chain VOCs which most probably emanated from the plastic mylar material which was used at the former MBF site. The ion count in this site blank (Sample #101) was 2014. The ion counts which were quantified ranged from 4187 in Sample #16 at the northwest corner of the McLachlan Investments site, to 832454 in Sample #11 at the former MBF site.

The analytical results for the four sites are summarized in Tables 1 through 4.

TABLE 1 - ANALYSIS OF SOIL GAS COLLECTION TUBES AT SITE #1  
PACIFIC SEACRAFT CORPORATION  
(measured in ion counts)

<u>Sample</u>	<u>TCE</u>	<u>PCE</u>	<u>Aliphatic Hydrocarbons</u>	<u>Aromatic Hydrocarbons</u>
1	26472	16007	16009	550240
2	1262	4102	44500	674007
3	124733	7141	18405	507550
5	0	2032	84089	810100
6	0	9673	13160	508219
7	0	12573	14326	151267

Note: Some trichloroethane (TCA) was noted in Sample #1 -  
(unquantifiable)

TABLE 2 - ANALYSIS OF SOIL GAS COLLECTION TUBES AT SITE #2  
FORMER MBF FACILITY  
(measured in ion counts)

<u>Sample</u>	<u>TCE</u>	<u>PCE</u>	<u>Aliphatic Hydrocarbons</u>	<u>Aromatic Hydrocarbons</u>
8	0	232656	205924	344925
9	38085	23584	433488	832454
11	233052	4176	80915	517823
101*	0	0	0	2014

\* (Site Blank)

Note: Sample #9 - PCE and TCE values elevated due to interference  
with hydrocarbon compounds

TABLE 3 - ANALYSIS OF SOIL GAS COLLECTION TUBES AT SITE #3  
JOHNSON CONTROLS - BATTERY DIVISION  
(measured in ion counts)

<u>Sample</u>	<u>TCE</u>	<u>PCE</u>	<u>Aliphatic</u> <u>Hydrocarbons</u>	<u>Aromatic</u> <u>Hydrocarbons</u>
12	0	180399	119959	58846
13	1797	14662	2098	0
14	1711	10857	2282	0
15	29057	25624	4389	7000

TABLE 4 - ANALYSIS OF SOIL GAS COLLECTION TUBES AT SITE #4  
McLACHLAN INVESTMENT COMPANY  
(measured in ion counts)

<u>Sample</u>	<u>TCE</u>	<u>PCE</u>	<u>Aliphatic</u> <u>Hydrocarbons</u>	<u>Aromatic</u> <u>Hydrocarbons</u>
16	4628	16022	3851	4187
17	127368	115053	27853	11765
18	2546	10488	895	0
19	0	3347	42724	11349

Trip Blank

102	0	0	0	0
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## DISCUSSION

Our soil gas survey shows a significant TCE hot spot on the former MBF property where the previous Tracer Research soil gas survey detected high TCE concentrations. This area primarily covers the entire southeast corner parking lot area of the site and partially up the southern portion of the east side driveway.

Our soil gas survey shows a significant PCE hot spot on the former MBF property where the previous Tracer Research soil gas survey detected high PCE concentrations. This area is located in the northeast corner of the site and the northern portion of the east side driveway.

Our soil gas survey shows the presence of a significant TCE and PCE hot spot on the McLachlan Investments Company property. This area is located near the first loading platform door along the railroad spur line on the west side of the building.

Since this soil gas survey confirms the other results of the previous Tracer Research soil gas survey, we recommend that Moore Business Forms conduct soil investigations in and around the identified TCE and PCE hot spots on their former site. Because of the presence of TCE and PCE on the site, Moore Business Forms should continue to monitor the on-site groundwater monitoring wells on a quarterly basis.

In addition, since it is unknown which former tenant of 1401 East Orangethorpe Avenue may have been responsible for the TCE and PCE contamination, we recommend that McLachlan Investments, as the current owners of the property, conduct a soil investigation in and around the identified TCE and PCE hot spot.

The soil investigations at both sites should be performed in a manner which will define the magnitude of soil contamination, define the horizontal and vertical extent of soil contamination and to determine if soil remediation is necessary.

## DISCUSSION

The highest ion counts of both TCE and PCE were found on the former MBF site, although they were found in different locations. As stated in the results section, the highest TCE count was found in the center of the southeast parking lot area. Although the 3rd highest count was found in Sample #3 on the Pacific Seacraft site, it was located within 10 feet of the southeast parking lot on the former MBF site. Since the nearest samples location to Sample #3 on the Pacific Seacraft site had a significantly lower count, it can be concluded that the very high counts in #3 are related to the same southeast parking lot area on the former MBF site, and not the Pacific Seacraft site. In addition, the 4th highest TCE count was located in the eastern driveway just north of the parking lot, on the former MBF site. Comparing these results to the previous Tracer Research soil gas study on the former MBF site, there is some correlation. A soil gas concentration of 87 ppm was found in the southeast parking lot area, to the northwest of the highest Petrex soil gas ion count. A concentration of 25 ppm was found in the southeast corner of this lot, very near the 3rd highest count found in Sample #3. A concentration of 2 ppm was found near Sample #9 in the eastern driveway where the 4th highest count was found. The only location which did not correlate was at Sample #8, at the eastern driveway entrance, which had a Tracer Research concentration of 380 ppm, but had a 0 ion count in the Petrex study.

### The PCE results

The aliphatic and aromatic hydrocarbons were widespread through all the sites.

However, significant ion counts of both TCE and PCE were found in the other two samples at this site. In addition, the samples from the other sites located closest to the southeast parking lot of the former MBF site also exhibited some of the highest TCE ion counts. These included Sample #3 at the Pacific Seacraft Corporation site and Sample #15 at the Johnson Controls site. While PCE appears more prevalent around the entire area, it also exhibits a similar pattern as the distribution of high TCE ion counts. Samples with the higher PCE ion counts from adjacent sites were located adjacent to some of the samples with high PCE ion counts on the former MBF site.

There were two other apparently isolated areas of elevated TCE and PCE, however, the most extensive area with the highest TCE and PCE soil vapor levels appear to be on the MBF Site, and at most of the other sites' sample points which are closest to their corresponding Site #2 points. The double wire samples (#4 and #10) are used in calibration prior to analyses, thus are not reported.

#### DISCUSSION

Our soil gas survey shows a significant TCE hot spot on the former MBF property where the previous Tracer Research soil gas survey detected high TCE concentrations. This area is primarily in the southeast corner parking lot area and the east side of the site.

Our soil gas survey shows a significant PCE hot spot on the former MBF property where the previous Tracer Research soil gas survey detected high PCE concentrations. This area is located in the northeast corner of the site.

Our soil gas survey shows the presence of a significant TCE and PCE hot spot on the McLachlan Investments Company property. This area is located near the first loading platform door along the railroad spur line along the west side of the building.

## RESULTS

PCE was detected in every sample at all four sites. TCE was also detected at every site, but only in 11 of the 17 samples. In addition, aliphatic hydrocarbons were detected in every sample at each site. Aromatic hydrocarbons were detected in all samples at Pacific Seacraft Corp. and the former MBF site. At Johnson Controls - Battery Division and McLachlan Investments Company, aromatic hydrocarbons were detected in three of the four samples at each site. Aromatic hydrocarbons were also detected in Site Blank #101 at the former MBF site, although at a significantly lower ion count. Therefore, it is believed that the aromatic hydrocarbons were emanating from the plastic mylar used to tie the sample tubes in place. Sample #101 did not contain any TCE, PCE or aliphatic hydrocarbons. A Final Report of chemical analysis, including the ion counts and GC Graphs for each sample and blank, plus a short narrative evaluation of the results, was received from NERI on January 21, 1992. A copy of this Final Report is included in Appendix No. 6.

Figure 2 shows the four sites, all sample locations, and the ion counts of TCE found at each sample location, while Figure 3 shows the same for PCE. TCE was detected in 3 of the 6 samples at the Pacific Seacraft Corp. site, 2 of the 3 samples at the former MBF site, 3 of the 4 samples at the Johnson Controls site and 3 of the 4 samples at the McLachlan Investments site. The highest ion count of TCE was 233052, found in Sample #11 located at the center of the southeast parking lot area of the former MBF site. The highest ion count of PCE was 232656, also found at this site, in Sample #8 located in the northeast corner driveway entrance. However, no TCE was found in this sample. The TCE ion counts which were quantified ranged from 1262 to 233052. PCE ion counts ranged from 2032 to 232656.

The aliphatic hydrocarbons consist of 6, 10 and 11 carbon chain compounds and dienes. The ion counts ranged from 119959 in Sample #12, located in the northwest corner of the Johnson Controls site, to 895 in Sample #18, located along the railroad spur on the McLachlan Investments site. The aromatic hydrocarbons consist not only of benzene, toluene, xylenes and ethylbenzene, which are gasoline components, but other volatile organic chemicals (VOCs) containing up to 9 carbon chain compounds. It is these higher carbon chain VOCs which most probably emanated from the plastic mylar material which was used at the former MBF site. The ion count in this site blank (Sample #101) was 2014. The ion counts which were quantified ranged from 832454 in Sample #11 at the former MBF site, to 4187 in Sample #16 at the northwest corner of the McLachlan Investments site.

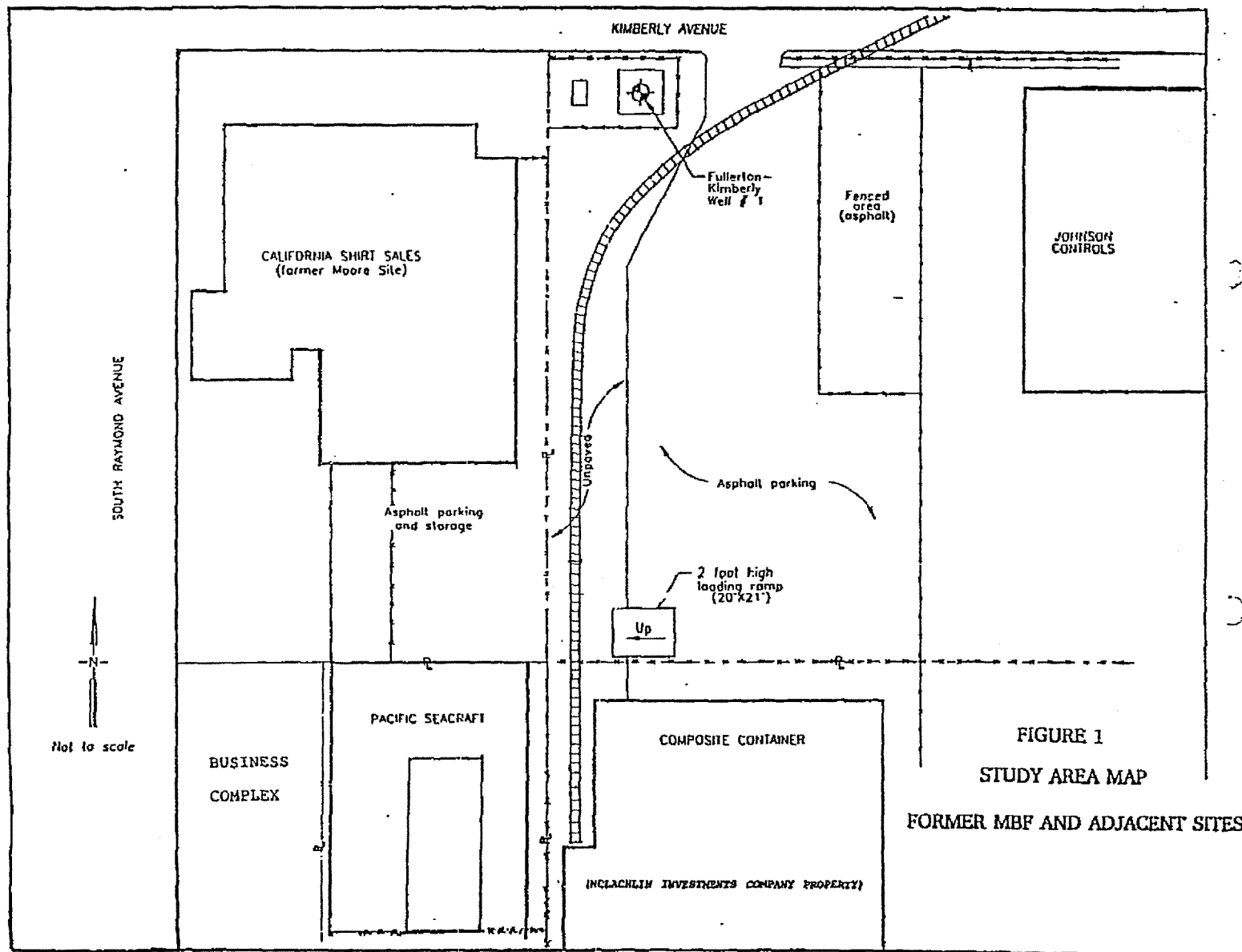
The analytical results for the four sites are summarized in Tables 1 through 4.

## FIGURES

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Appendix & Table pages  
will be on yellow  
paper like the Museum  
Report. OK?*

FIGURES NO. 1 THROUGH NO. 3

RWQCB - 015045



SOUTH RAYMOND AVENUE

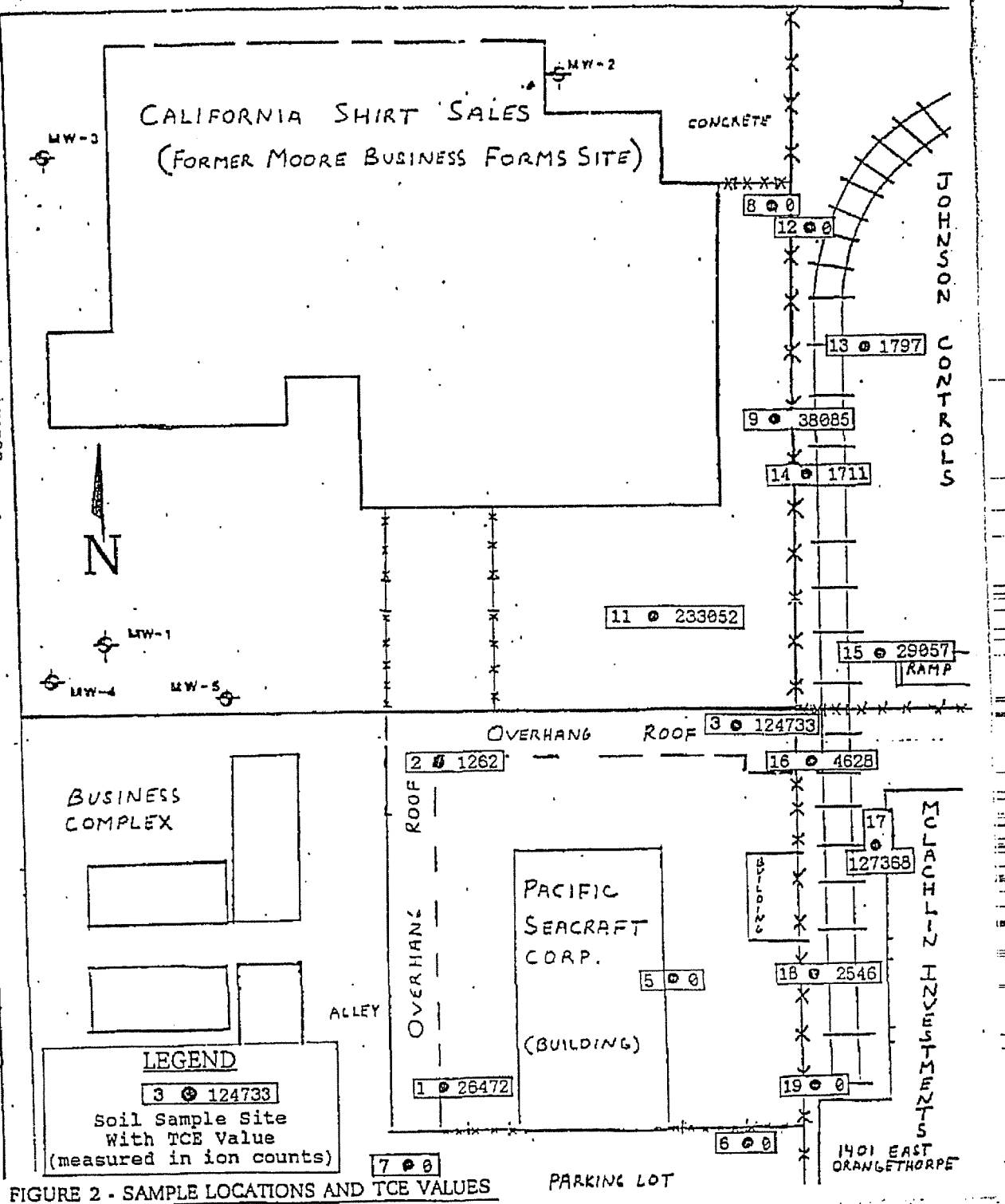
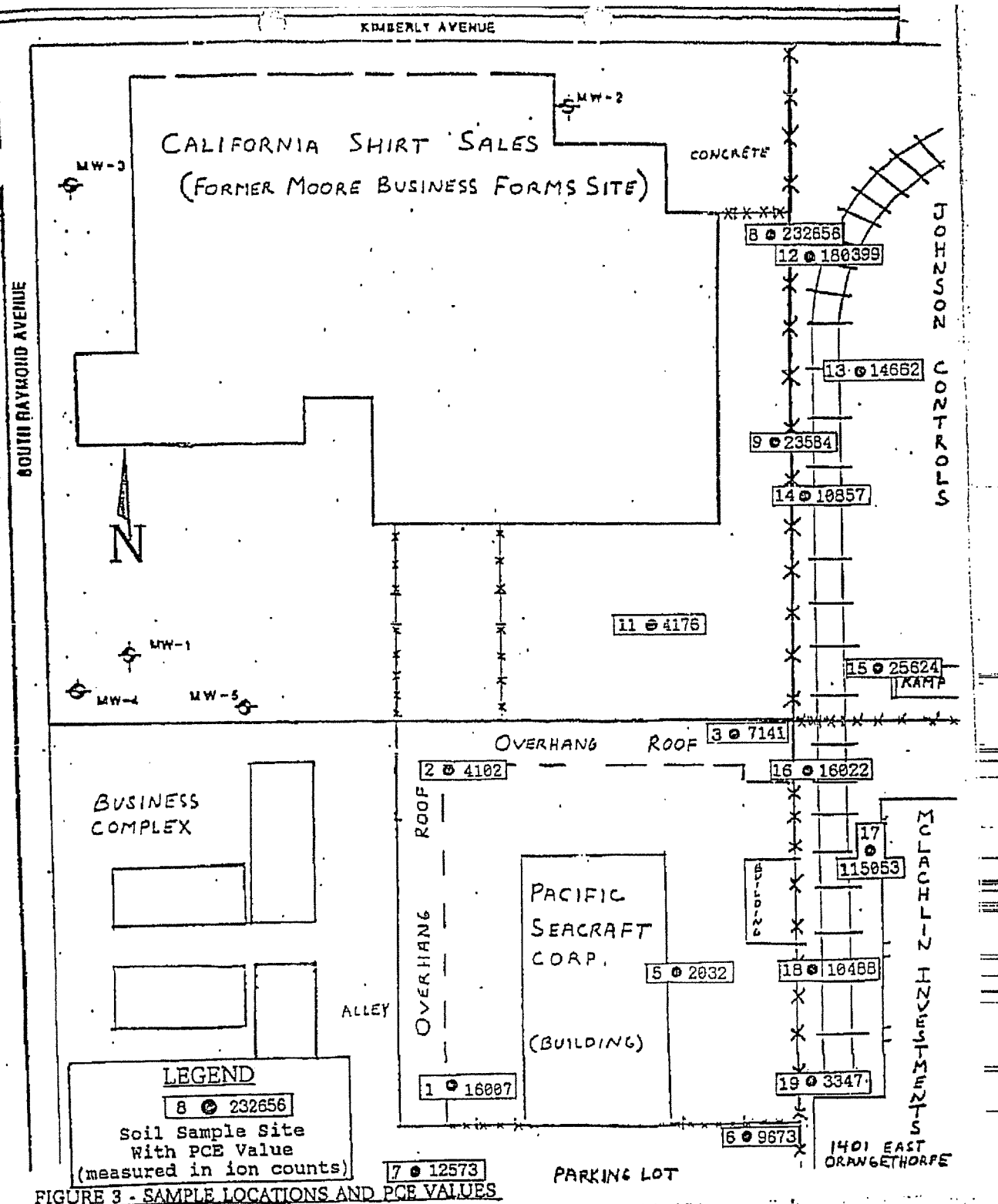


FIGURE 2 - SAMPLE LOCATIONS AND TCE VALUES



*I'm getting these  
together.*

## APPENDIX NO. 1

SITE ACCESS REQUEST LETTERS TO:

PACIFIC SEACRAFT CORPORATION

CALIFORNIA SHIRT SALES

JOHNSON CONTROLS - BATTERY DIVISION

MCLACHLIN INVESTMENTS COMPANY

## APPENDIX NO. 2

FIELD MAPS AND RECORDS

PETREX TUBE PLACEMENT LOCATIONS AND I.D. NUMBERS

SOIL GAS INVESTIGATION SITES NO. 1 THROUGH NO. 4

## APPENDIX NO. 3

PHOTOGRAPHS OF PETREX TUBE PLACEMENTS

SITE NO. 1 - PACIFIC SEACRAFT CORPORATION

SITE NO. 2 - CALIFORNIA SHIRT SALES

## APPENDIX NO. 4

### STANDARD METHODS FOR THE INSTALLATION AND REMOVAL OF PETREX SOIL GAS TUBES

## APPENDIX NO. 5

### ACCOMPANYING FORMS SUBMITTED WITH PETREX TUBE SAMPLES

- 1) PETREX CHAIN OF CUSTODY FORM
- 2) BAG CONTENT INFORMATION SHEETS
- 3) WIRE SUBMITTAL FORM

# APPENDIX NO. 6

## PETREX FINAL REPORT AND LABORATORY ANALYSES